

**CLAIMS**

1. In a wireless communication system, a method for utilizing a  
2 single Internet Protocol address for multiple Point-to-Point Protocol instances  
between a single wireless device and a wireless network, comprising:  
4 establishing a first Point-to-Point Protocol link having an Internet  
Protocol Address;  
6 establishing a second Point-to-Point Protocol link having the same  
Internet Protocol Address as the first Point-to-Point Protocol link; and  
8 differentiating the endpoints of the first Point-to-Point Protocol link  
and the second Point-to-Point Protocol link using a link characteristic.
2. The method of claim 1 wherein the link characteristic is Quality of  
2 Service.
3. The method of claim 1 wherein the link characteristic is  
2 compression type.
4. The method of claim 1 wherein the link characteristic is encryption  
2 level.
5. The method of claim 1 wherein the link characteristic is Radio Link  
2 Protocol transmission delay.
6. The method of claim 1 wherein the link characteristic is  
2 guaranteed delivery level.
7. The method of claim 1 wherein the wireless device uses Simple  
2 Internet Protocol service.
8. The method of claim 1 wherein the wireless device uses Mobile  
2 Internet Protocol service.

9. In a wireless communication system, a method for differentiating  
2 Point-to-Point Protocol session termination endpoints within a wireless device  
that supports multiple Point-to-Point Protocol sessions associated with a single  
4 Internet Protocol Address, comprising:

establishing an initial Point-to-Point Protocol session between the  
6 wireless device and a wireless network node having an Internet Protocol  
address;

8 initiating a subsequent Point-to-Point Protocol session, between  
the wireless device and the wireless network node, using an Internet Protocol  
10 Control Protocol Configuration-Request message requesting the Internet  
Protocol Address of the initial Point-to-Point Protocol session in an Internet  
12 Protocol Address Configuration Option of the message, issued from the wireless  
device to the wireless network node;

14 searching for and finding, by the wireless network node, the initial  
Point-to-Point Protocol session with an Internet Protocol Address matching the  
16 requested Internet Protocol Address of the subsequent Point-to-Point Protocol  
session and a Mobile Station Identifier matching the Mobile Station Identifier of  
18 the wireless device;

concluding, by the wireless network node, that the subsequent  
20 Point-to-Point Protocol session is a multiple Point-to-Point Protocol session  
event;

22 accepting, by the wireless network node, the requested Internet  
Protocol address for the subsequent Point-to-Point Protocol session and  
24 acknowledging the acceptance in an Internet Protocol Control Protocol  
Configuration-Acknowledgement message returned to the wireless device  
26 having the requested Internet Protocol Address in the Internet Protocol Address  
Configuration Option of the Configuration-Acknowledgement message;

28 allowing, by the wireless network node, the exchange of data  
packets with the wireless device; and

30 differentiating the endpoints of the initial Point-to-Point Protocol  
session and the subsequent Point-to-Point Protocol session using a session link  
32 characteristic.

10. The method of claim 9 wherein the wireless network node is a  
2 Packet Data Service Node.

11. The method of claim 9 wherein the wireless network node is an  
2 Interworking Function.

12. The method of claim 9 wherein the link characteristic is Quality of  
2 Service.

13. The method of claim 9 wherein the link characteristic is  
2 compression type.

14. The method of claim 9 wherein the link characteristic is encryption  
2 level.

15. The method of claim 9 wherein the link characteristic is Radio Link  
2 Protocol transmission delay.

16. The method of claim 9 wherein the link characteristic is  
2 guaranteed delivery level.

17. The method of claim 9 wherein the wireless device uses Simple  
2 Internet Protocol service.

18. The method of claim 9 wherein the wireless device uses Mobile  
2 Internet Protocol service.

19. In a wireless communication system, a method for providing  
2 multiple grades of Radio Link Protocol service to an application of a wireless  
device, comprising:

4 establishing a Point-to-Point Protocol session for each grade of  
Radio Link Protocol service used by the application to create a set of Point-to-

- 6 Point Protocol sessions, where each Point-to-Point Protocol session belonging  
to the set has the same Internet Protocol address; and
- 8 differentiating the endpoint of each Point-to-Point Protocol session  
in the set using a session link characteristic.

20. The method of claim 19 wherein the link characteristic is Quality of  
2 Service.

21. The method of claim 19 wherein the link characteristic is  
2 compression type.

22. The method of claim 19 wherein the link characteristic is  
2 encryption level.

23. The method of claim 19 wherein the link characteristic is Radio  
2 Link Protocol transmission delay.

24. The method of claim 19 wherein the link characteristic is  
2 guaranteed delivery level.

25. The method of claim 19 wherein the wireless device uses Simple  
2 Internet Protocol service.

26. The method of claim 19 wherein the wireless device uses Mobile  
2 Internet Protocol service.

27. In a wireless communication system, a method for providing at  
2 least one grade of Radio Link Protocol service to a first application, and at least  
one grade of Radio Link Protocol service to at least a second application of a  
4 wireless device, comprising:

establishing at least one Point-to-Point Protocol session for the at  
6 least one grade of Radio Link Protocol service used by the first application, and  
establishing at least one Point-to-Point Protocol session for the at least one

8 grade of Radio Link Protocol service used by the at least second application,  
wherein each of the Point-to-Point Protocol sessions has the same Internet  
10 Protocol Address; and  
differentiating the endpoint of each Point-to-Point Protocol  
12 sessions using a session link characteristic.

28. The method of claim 27 wherein the link characteristic is Quality of  
2 Service.

29. The method of claim 27 wherein the link characteristic is  
2 compression type.

30. The method of claim 27 wherein the link characteristic is  
2 encryption level.

31. The method of claim 27 wherein the link characteristic is Radio  
2 Link Protocol transmission delay.

32. The method of claim 27 wherein the link characteristic is  
2 guaranteed delivery level.

33. The method of claim 27 wherein the wireless device uses Simple  
2 Internet Protocol service.

34. The method of claim 27 wherein the wireless device uses Mobile  
2 Internet Protocol service.

35. A wireless communication system comprising:  
2 a wireless device for supporting multiple Point-to-Point Protocol  
sessions having an identical Internet Protocol Address and different link  
4 characteristics; and

6 a wireless network node for exchanging data packets with the  
wireless device by differentiating the endpoint of each of the multiple Point-to-  
Point Protocol sessions using a session link characteristic.

2 36. The method of claim 35 wherein the wireless network node is a  
Packet Data Service Node.

2 37. The method of claim 35 wherein the wireless network node is an  
Interworking Function.

2 38. The method of claim 35 wherein the link characteristic is Quality of  
Service.

2 39. The method of claim 35 wherein the link characteristic is  
compression type.

2 40. The method of claim 35 wherein the link characteristic is  
encryption level.

2 41. The method of claim 35 wherein the link characteristic is Radio  
Link Protocol transmission delay.

2 42. The method of claim 35 wherein the link characteristic is  
guaranteed delivery level.

2 43. The method of claim 35 wherein the wireless device uses Simple  
Internet Protocol service.

2 44. The method of claim 35 wherein the wireless device uses Mobile  
Internet Protocol service.

45. A wireless device comprising a memory, wherein the memory  
embodies a method for supporting multiple Point-to-Point Protocol links having  
an identical Internet Protocol address, the method comprising:

establishing a first Point-to-Point Protocol link having an Internet  
Protocol Address;

establishing a second Point-to-Point Protocol link having the same  
Internet Protocol Address as the first Point-to-Point Protocol link; and

differentiating the endpoints of the first Point-to-Point Protocol link  
and the second Point-to-Point Protocol link using a link characteristic.

46. The wireless device of claim 45 wherein the link characteristic is  
Quality of Service.

47. The wireless device of claim 45 wherein the link characteristic is  
compression type.

48. The wireless device of claim 45 wherein the link characteristic is  
encryption level.

49. The wireless device of claim 45 wherein the link characteristic is  
Radio Link Protocol transmission delay.

50. The wireless device of claim 45 wherein the link characteristic is  
guaranteed delivery level.

51. The wireless device of claim 45 wherein the wireless device uses  
Simple Internet Protocol service.

52. The wireless device of claim 45 wherein the wireless device uses  
Mobile Internet Protocol service.

53. A wireless device comprising a memory, wherein the memory  
embodies a method for supporting multiple Point-to-Point Protocol links having  
an identical Internet Protocol address, the method comprising:

establishing an initial Point-to-Point Protocol session between the  
wireless device and a wireless network node having an Internet Protocol  
address; and

initiating a subsequent Point-to-Point Protocol session between  
the wireless device and the wireless network node, by using an Internet  
Protocol Control Protocol Configuration-Request message requesting the  
Internet Protocol Address of the initial Point-to-Point Protocol session in an  
Internet Protocol Address Configuration Option of the message, issued from the  
wireless device to the wireless network node.

54. The wireless device of claim 45 wherein the wireless device uses  
Simple Internet Protocol service.

55. The wireless device of claim 45 wherein the wireless device uses  
Mobile Internet Protocol service.

56. A wireless network node comprising a memory, wherein the  
memory embodies a method for supporting multiple Point-to-Point Protocol links  
having an identical Internet Protocol address, the method comprising:

establishing an initial Point-to-Point Protocol session with a  
wireless device having an Internet Protocol address;

establishing a subsequent Point-to-Point Protocol session with the  
wireless device in response to an Internet Protocol Control Protocol  
Configuration-Request message from the wireless device requesting the  
Internet Protocol Address of the initial Point-to-Point Protocol session in an  
Internet Protocol Address Configuration Option of the message;

searching for and finding the initial Point-to-Point Protocol session  
with an Internet Protocol Address matching the requested Internet Protocol  
Address of the subsequent Point-to-Point Protocol session and a Mobile Station  
Identifier matching the Mobile Station Identifier of the wireless device;



concluding that the subsequent Point-to-Point Protocol session is  
16 a multiple Point-to-Point Protocol session event;  
accepting the requested Internet Protocol address for the  
18 subsequent Point-to-Point Protocol session and acknowledging the acceptance  
in an Internet Protocol Control Protocol Configuration-Acknowledgement  
20 message returned to the wireless device having the requested Internet Protocol  
Address in the Internet Protocol Address Configuration Option of the  
22 Configuration-Acknowledgement message;  
allowing the exchange of data packets with the wireless device;  
24 and  
differentiating the endpoints of the initial Point-to-Point Protocol  
26 session and the subsequent Point-to-Point Protocol session using a session link  
characteristic.

57. The wireless network node of claim 56 wherein the wireless  
2 network node is a Packet Data Service Node.

58. The wireless network node of claim 56 wherein the wireless  
2 network node is an Interworking Function.

59. The wireless network node of claim 56 wherein the link  
2 characteristic is Quality of Service.

60. The wireless network node of claim 56 wherein the link  
2 characteristic is compression type.

61. The wireless network node of claim 56 wherein the link  
2 characteristic is encryption level.

62. The wireless network node of claim 56 wherein the link  
2 characteristic is Radio Link Protocol transmission delay.

63. The wireless network node of claim 56 wherein the link  
2 characteristic is guaranteed delivery level.

64. The wireless network node of claim 56 wherein the wireless  
2 device uses Simple Internet Protocol service.

65. The wireless network node of claim 56 wherein the wireless  
2 device uses Mobile Internet Protocol service.

66. A wireless network node comprising a memory, wherein the  
2 memory embodies a method for supporting multiple Point-to-Point Protocol links  
having an identical Internet Protocol address, the method comprising:  
4 establishing a first Point-to-Point Protocol link with a wireless  
device having an Internet Protocol Address;  
6 establishing a second Point-to-Point Protocol link with a wireless  
device having the same Internet Protocol Address as the first Point-to-Point  
8 Protocol link; and  
10 differentiating the endpoints of the first Point-to-Point Protocol link  
and the second Point-to-Point Protocol link within the wireless device using a  
link characteristic.

67. The wireless network node of claim 66 wherein the wireless  
2 network node is a Packet Data Service Node.

68. The wireless network node of claim 66 wherein the wireless  
2 network node is an Interworking Function.

69. The wireless network node of claim 66 wherein the link  
2 characteristic is Quality of Service.

70. The wireless network node of claim 66 wherein the link  
2 characteristic is compression type.

71. The wireless network node of claim 66 wherein the link  
2 characteristic is encryption level.

72. The wireless network node of claim 66 wherein the link  
2 characteristic is Radio Link Protocol transmission delay.

73. The wireless network node of claim 66 wherein the link  
2 characteristic is guaranteed delivery level.

74. The wireless network node of claim 66 wherein the wireless  
2 device uses Simple Internet Protocol service.

75. The wireless network node of claim 66 wherein the wireless  
2 device uses Mobile Internet Protocol service.

76. A wireless device comprising;  
2 a wireless modem, a transmitter, and an antenna for establishing  
a wireless connection to a wireless network;  
4 a control processor; and  
a memory coupled to the control processor having code or  
6 instructions for directing the control processor to establish multiple Point-to-  
Point Protocol sessions having an identical Internet Protocol address and  
8 different link characteristics with the wireless network, and for differentiating  
endpoints of the Point-to-Point Protocol sessions using a session link  
10 characteristic.

77. The wireless device of claim 76 wherein the link characteristic is  
2 Quality of Service.

78. The wireless device of claim 76 wherein the link characteristic is  
2 compression type.

79. The wireless device of claim 76 wherein the link characteristic is encryption level.

80. The wireless device of claim 76 wherein the link characteristic is Radio Link Protocol transmission delay.

81. The wireless device of claim 76 wherein the link characteristic is guaranteed delivery level.

82. The wireless device of claim 76 wherein the wireless device uses Simple Internet Protocol service.

83. The wireless device of claim 76 wherein the wireless device uses Mobile Internet Protocol service.

84. A wireless network node comprising:  
a control processor; and  
a memory coupled to the control processor having program code or instructions for directing the control processor to access instructions in the memory to:  
search for an existing Point-to-Point Protocol connection with a matching Internet Protocol address and Mobile Station Identifier in response to an Internet Protocol Control Protocol Configuration Request message from a wireless device requesting a succeeding Point-to-Point Protocol connection by specifying the known address of an initial connection in the Internet Protocol Address Configuration Option of the Configuration Request message;  
match the Internet Protocol address and Mobile Station Identifier of the requested Point-to-Point Protocol connection to the Internet Protocol address and Mobile Station Identifier of the initial connection;  
conclude that the requested connection is a multiple Point-to-Point Protocol connection event;

18 send a Configuration Acknowledgement message to the wireless  
device specifying the requested address in the Internet Protocol Address  
Configuration Option of the Configuration Acknowledgement message;  
20 allow packet exchange with the wireless device; and  
route Internet Protocol packets to different Point-to-Point Protocol  
22 connection endpoints within the wireless device having the same Internet  
Protocol address based on a characteristic of the connection.

85. The wireless network node of claim 84 wherein the wireless  
2 network node is a Packet Data Service Node.

86. The wireless network node of claim 84 wherein the wireless  
2 network node is an Interworking Function.

87. The wireless network node of claim 84 wherein the link  
2 characteristic is Quality of Service.

88. The wireless network node of claim 84 wherein the link  
2 characteristic is compression type.

89. The wireless network node of claim 84 wherein the link  
2 characteristic is encryption level.

90. The wireless network node of claim 84 wherein the link  
2 characteristic is Radio Link Protocol transmission delay.

91. The wireless network node of claim 84 wherein the link  
2 characteristic is guaranteed delivery level.

92. The wireless network node of claim 84 wherein the wireless  
2 device uses Simple Internet Protocol service.

93. The wireless network node of claim 84 wherein the wireless  
2 device uses Mobile Internet Protocol service.

94. A computer-readable medium having instructions stored thereon  
2 to cause computers in a communication system to perform a method for utilizing  
a single Internet Protocol address for multiple Point-to-Point Protocol instances  
4 between a single wireless device and a wireless network, the method  
comprising:  
6 establishing a first Point-to-Point Protocol link having an Internet  
Protocol Address;  
8 establishing a second Point-to-Point Protocol link having the same  
Internet Protocol Address as the first Point-to-Point Protocol link; and  
10 differentiating the endpoints of the first Point-to-Point Protocol link  
and the second Point-to-Point Protocol link using a link characteristic.

95. The computer readable medium of claim 94 wherein the link  
2 characteristic is Quality of Service.

96. The computer readable medium of claim 94 wherein the link  
2 characteristic is compression type.

97. The computer readable medium of claim 94 wherein the link  
2 characteristic is encryption level.

98. The computer readable medium of claim 94 wherein the link  
2 characteristic is Radio Link Protocol transmission delay.

99. The computer readable medium of claim 94 wherein the link  
2 characteristic is guaranteed delivery level.

100. The computer readable medium of claim 94 wherein the wireless  
2 device uses Simple Internet Protocol service.

101. The computer readable medium of claim 94 wherein the wireless  
2 device uses Mobile Internet Protocol service.

102. A computer readable medium having instructions stored thereon  
2 to perform a method for differentiating Point-to-Point Protocol session  
termination endpoints within a wireless device that supports multiple Point-to-  
4 Point Protocol sessions associated with a single Internet Protocol Address, the  
method comprising:

6 establishing an initial Point-to-Point Protocol session between the  
wireless device and a wireless network node having an Internet Protocol  
8 address;

initiating a subsequent Point-to-Point Protocol session, between  
10 the wireless device and the wireless network node, using an Internet Protocol  
Control Protocol Configuration-Request message requesting the Internet  
12 Protocol Address of the initial Point-to-Point Protocol session in an IP Address  
Configuration Option of the message, issued from the wireless device to the  
14 wireless network node;

searching for and finding, by the wireless network node, the initial  
16 Point-to-Point Protocol session with an Internet Protocol Address matching the  
requested Internet Protocol Address of the subsequent Point-to-Point Protocol  
18 session and a Mobile Station Identifier matching the Mobile Station Identifier of  
the wireless device;

20 concluding, by the wireless network node, that the subsequent  
Point-to-Point Protocol session is a multiple Point-to-Point Protocol session  
22 event;

accepting, by the wireless network node, the requested Internet  
24 Protocol address for the subsequent Point-to-Point Protocol session and  
acknowledging the acceptance in an Internet Protocol Control Protocol  
26 Configuration-Acknowledgement message returned to the wireless device  
having the requested Internet Protocol Address in the Internet Protocol Address  
28 Configuration Option of the Configuration-Acknowledgement message;

allowing, by the wireless network node, the exchange of data  
30 packets with the wireless device; and

differentiating the endpoints of the initial Point-to-Point Protocol session and the subsequent Point-to-Point Protocol session using a session link characteristic.

103. The computer readable medium of claim 102 wherein the wireless network node is a Packet Data Service Node.

104. The computer readable medium of claim 102 wherein the wireless network node is an Interworking Function.

105. The computer readable medium of claim 102 wherein the link characteristic is Quality of Service.

106. The computer readable medium of claim 102 wherein the link characteristic is compression type.

107. The computer readable medium of claim 102 wherein the link characteristic is encryption level.

108. The computer readable medium of claim 102 wherein the link characteristic is Radio Link Protocol transmission delay.

109. The computer readable medium of claim 102 wherein the link characteristic is guaranteed delivery level.

110. The computer readable medium of claim 102 wherein the wireless device uses Simple Internet Protocol service.

111. The computer readable medium of claim 102 wherein the wireless device uses Mobile Internet Protocol service.

112. A computer readable medium having instruction stored thereon to casue computers in a wireless communication system to perform a method for



providing multiple grades of Radio Link Protocol service to an application of a  
4 wireless device, the method comprising:

establishing a Point-to-Point Protocol session for each grade of  
6 Radio Link Protocol service used by the application to create a set of Point-to-  
Point Protocol sessions, where each Point-to-Point Protocol session belonging  
8 to the set has the same Internet Protocol address; and

differentiating the endpoint of each Point-to-Point Protocol  
10 sessions in the set using a session link characteristic.

113. The computer readable medium of claim 112 wherein the link  
2 characteristic is Quality of Service.

114. The computer readable medium of claim 112 wherein the link  
2 characteristic is compression type.

115. The computer readable medium of claim 112 wherein the link  
2 characteristic is encryption level.

116. The computer readable medium of claim 112 wherein the link  
2 characteristic is Radio Link Protocol transmission delay.

117. The computer readable medium of claim 112 wherein the link  
2 characteristic is guaranteed delivery level.

118. The computer readable medium of claim 112 wherein the wireless  
2 device uses Simple Internet Protocol service.

119. The computer readable medium of claim 112 wherein the wireless  
2 device uses Mobile Internet Protocol service.

120. A computer readable medium having instructions stored thereon  
2 to cause computers in a wireless communication system to perform a method for  
providing at least one grade of Radio Link Protocol service to a first application,

- 4 and at least one grade of Radio Link Protocol service to at least a second  
application of a wireless device, the method comprising:
- 6 establishing at least one Point-to-Point Protocol session for the at  
least one grade of Radio Link Protocol service used by the first application, and
- 8 establishing at least one Point-to-Point Protocol session for the at least one  
grade of Radio Link Protocol service used by the at least second application,  
10 wherein each of the Point-to-Point Protocol sessions has the same Internet  
Protocol Address; and
- 12 differentiating the endpoint of each Point-to-Point Protocol  
sessions using a session link characteristic.

121. The computer readable medium of claim 120 wherein the link  
2 characteristic is Quality of Service.

122. The computer readable medium of claim 120 wherein the link  
2 characteristic is compression type.

123. The computer readable medium of claim 120 wherein the link  
2 characteristic is encryption level.

124. The computer readable medium of claim 120 wherein the link  
2 characteristic is Radio Link Protocol transmission delay.

125. The computer readable medium of claim 120 wherein the link  
2 characteristic is guaranteed delivery level.

126. The computer readable medium of claim 120 wherein the wireless  
2 device uses Simple Internet Protocol service.

127. The computer readable medium of claim 120 wherein the wireless  
2 device uses Mobile Internet Protocol service.